

ERD6 — SBU R&D PROJECT FY2019

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Stony Brook **University**

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RICH-PROTOTYPE STUDIES

2

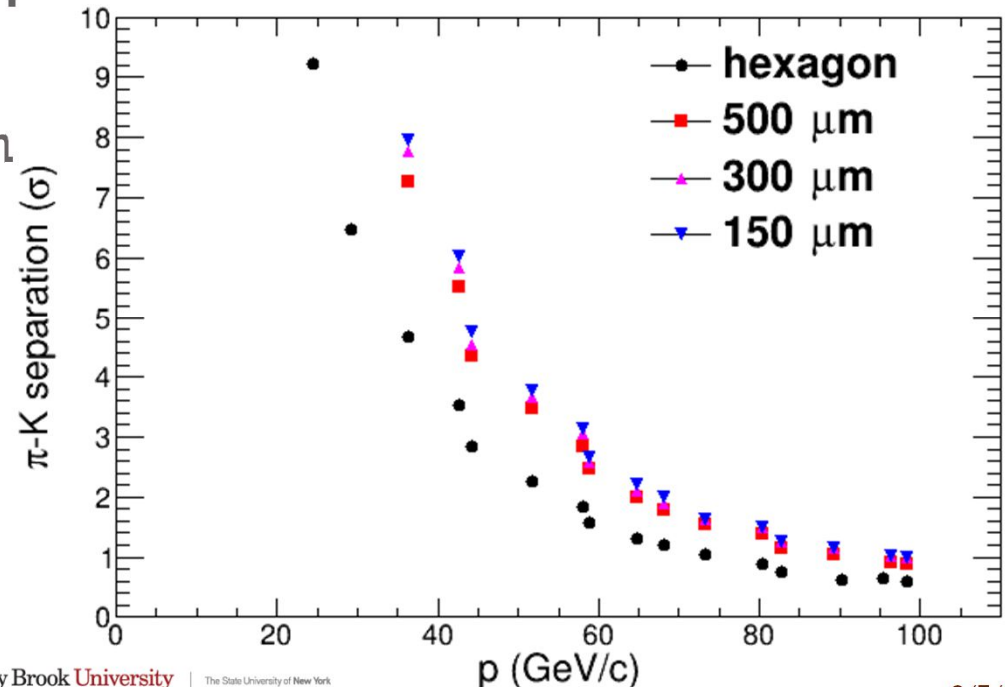
- 2015 conclusion for RICH prototype

- ... segmentation of the readout, we have used for our prototype is not sufficient ...

- ... radiator gas, CF_4 provides only little diffusion so that charge sharing over more than one pad on the readout plane is essentially excluded ...

- Possible solution:

- ... overcome this limitation one has to either reduce the pad size which will result in a significantly higher channel count ...



NEW RICH-PROTOTYPE STUDIES

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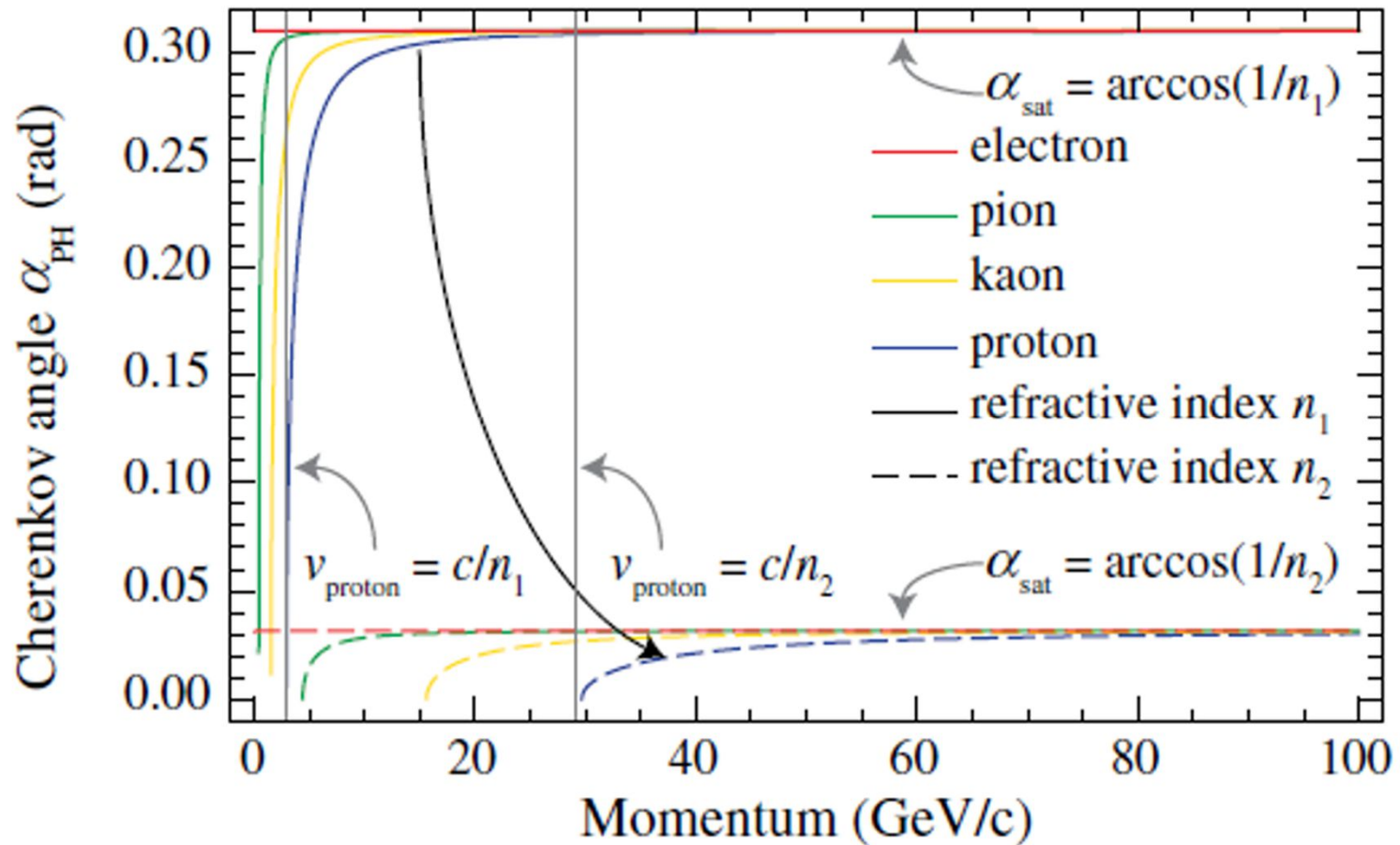
- 2018 conclusion for RICH prototype
 - ... let's try out a new approach ...
 - ... and instead of moving mountains let the mountains move you ...
 - ... keep pad-size-resolution –improve ring-resolution. How?
 - Increase ring-diameter with (almost) same radiator CF_4 .
 - Almost \rightarrow meta-materials
 - Meta-materials: *a synthetic composite material with a structure such that it exhibits properties not usually found in natural materials, especially a negative refractive index.*
- With *TOM*¹ it should be possible to control Cherenkov radiation

¹ Transformation-Optical Metamaterials

NEW RICH-PROTOTYPE STUDIES

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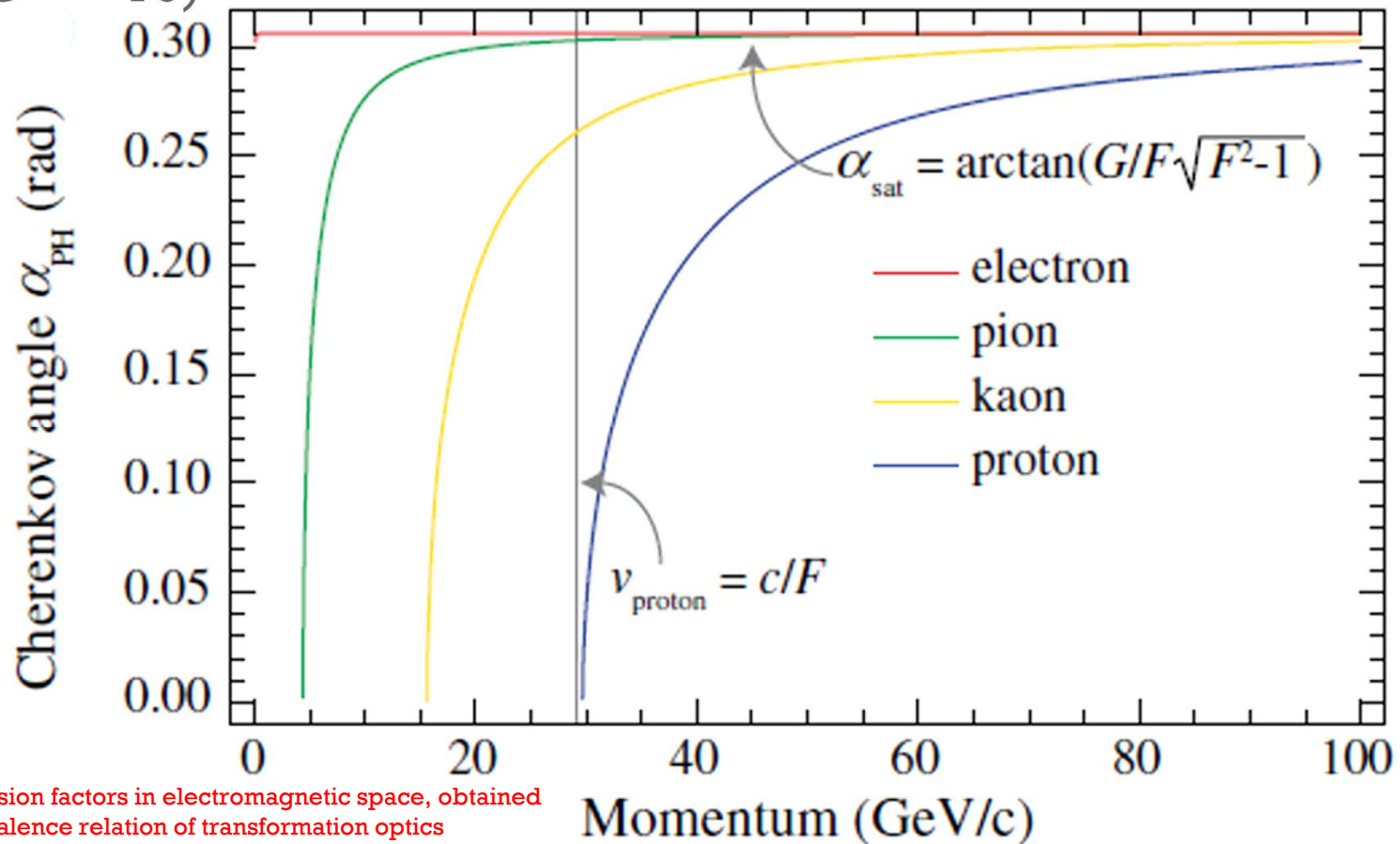
- Aerogel ($n_1 = 1.05$) vs. CF_4 radiator ($n_2 = 1.0005$)



NEW RICH-PROTOTYPE STUDIES

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- Meta-CF₄ radiator (longitudinal $F^2 = 1.0005$ and transversal $G^2 = 10$)

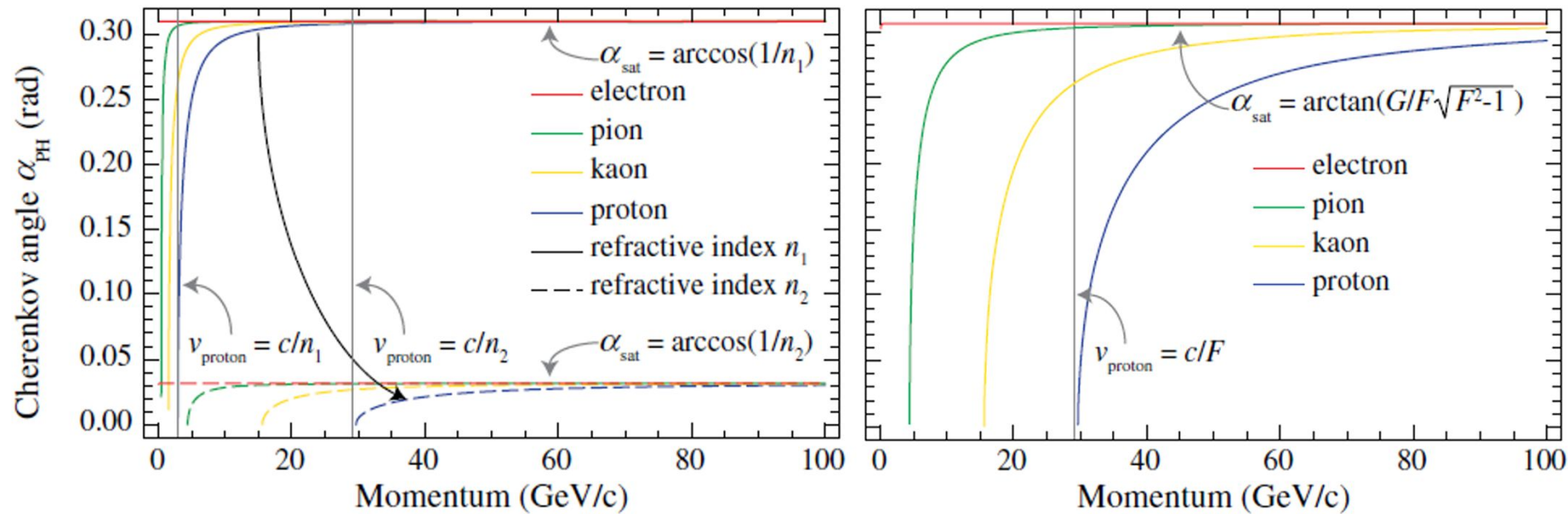


² F, G : compression factors in electromagnetic space, obtained by equivalence relation of transformation optics

NEW RICH-PROTOTYPE STUDIES

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○ Side-by-side (same Y-Axis)



NEW RICH-PROTOTYPE STUDIES

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- **Project**
 - Investigate *TOMs* and implement in existing RICH prototype
 - Proof-principle experiment in test-beam
- **Estimated budget request: ~\$80k for TOMs, modification of radiator vessel, gas, test-beam**